

FARIAS CONVENIENCE STORE MAPPING PROCESS WITH THE SUPPORT OF IDEF0 IN ORDER TO DETERMINE THE REQUIREMENTS TO CHOOSE AN INFORMATION SYSTEM.

Natalia Barbosa Farias

Tecnóloga em Agronegócio

Rafaela Barbosa Ribeiro

Tecnóloga em Agronegócio

Prof. Dr. Gilberto José da Cunha

Professor da Fatec Sebrae e Fatec Mogi das Cruzes

Prof(a) Eliane Mendes Cieplinski

Professora da Fatec Sebrae

Prof(a) Maria Cristina Pereira da Silva

Professora da Fatec Sebrae

Summary:

This paper presents the processes mapping for Farias convenience store to help the micro entrepreneur to optimize the operation of the business choosing a specific information system. To do that informal interviews have been made; observations of the processes occurred in the mini market; survey and mapping of the processes with the IDEF0 methodology. It was possible to collect data and information to give support in the specification of the more appropriate information system to the organization, according to desired characteristics to the mini market.

The methodology used was qualitative descriptive. The work involved all employees of the company who provided data and allowed direct observation of daily routine in the mini market. The information obtained allowed the requirements' definition for the choice of the information system.

Keywords: Information System, Process, IDEF0.

Introduction

Micro enterprise usually faces some difficulties to adapt themselves to new technologies due to little knowledge or for thinking that the investment is too high. However, it is seen that not using the technological resources may bring them some barriers to overcome in the organization management.

The management difficulties of small companies are related to the lack of automation, which is a powerful resource to a successful administration aiming to control purchases, sales, stockings, payment, cleanness, cash flow among others.

Being aware of microentrepreneurs' little knowledge and the minor amount of capital for investment, the technology and the Information Systems (IS) are able to propose improvements to serve small business owners, including small agrobusiness retailers such as convenience stores.

This work purpose was to map the company's processes, focusing on the business needs to define which Information System requirements would be necessary to fit Farias Convenience Store routines. The system should also permit the micro enterprise information to be organized and processed in order to have a better management of its processes as well as more confidence to the decision taker.

Agribusiness in Brazil

According to Rufino (1999, apud ARAUJO, 2008, p.16) agrobusiness is:

“o conjunto de todas as operações e transformações envolvidas desde a fabricação dos instrumentos agropecuários, das operações de produção nas unidades agropecuárias, até o processamento e

distribuição e consumo dos produtos agropecuários “in natura” ou industrializados”¹

The more agrobusiness is understood the more it becomes a powerful tool for those who are in charge of taking decisions permitting them to elaborate more profitable strategies. This perception must be understood according to what is related to “before the gate”, “inside the gate” and “out of the gate” ² (ARAUJO, 2008).

Information Systems

Information Systems (IS) may be defined as a set of components composed by people, hardware, software, communication networking, data storage resources and policies that will transform data into information. (O’ BRIEN e MARAKAS, 2007, p.4).

Laudon and Laudon (2007, p.9) emphasize that these components are related to each other, collecting, processing, and storing information that support an organization decision taking. (LAUDON e LAUDON, 2007, p.9).

To Stair (1998, apud BAZZOTTI AND GARCIA, p. 5 s/d) an information system is a range of elements or components inter-related that collect (input), manipulate, store (process), disseminate (output) data and information as well as providing “feedback” strategy.

IDEF0

Companies have been increasingly looking for strategies to become more competitive in the market, and based on this search it was observed the necessity of identifying the processes that are happening in the organizations. To spot the processes implemented in the companies, it is possible to use the IDEF0 as a tool, because it helps to understand detailed mapping processes to support the managers in taking decisions.

The IDEF0 (Integrated Definition for Function Modelling 0) was requested by the United States Air Force and was developed in the early 1970s by a program called

¹ “the set of all operations and transformations involved from the manufacturing of agricultural tools, from the production operations in agricultural plants to the processing, distribution and consumption of “in natura” or industrialized agricultural products” (our translation)

Integrated Computer Aided Manufacturing (ICAM), whose objective was seeking higher productivity in the aerospace manufacturing industry (IDEF0, 1993).

There are several IDEF methods, considering that each one was designed to permit different activities of analyses and development of systems (OLIVEIRA, 2010).

IDEF0 was created to describe the settings of a system by decomposing its functions into a process and consequently ordering relations between inputs and outputs. These inputs and outputs are connected by means of arrows and are classified by mechanisms (IDEF1, 1990).

IDEF0 is a methodology that patterns decisions, actions and activities of a company or system in a standardized way. As an analysis tool, IDEF0 helps in the modeling and identifying functions performed in an organization, it defines what the current system does well and what it does wrong. Thus, IDEF0 models are frequently created as one of the first tasks for a system development (IDEF0, s/d).

IDEF0 has combined graphic and textual elements, which are introduced in an organized and systematic way, focusing the learning about the system, set up by a hierarchical diagrams series which gradually display detailed levels of functions and the system context interfaces (OLIVEIRA, 2010).

According to Aguilar-Savén (2004), the IDEF0 standard is very strict but promotes easy understanding, which is a positive characteristic, because it makes clear to the reader or the manager what really happens in the company.

Its representations are made of boxes interconnected by arrows, considering that a box offers a function description, the boxes are labeled and numbered inside its shape/ outline (OLIVEIRA, 2010). The IDEF0 model is made of diagram, text, and glossary.

Figure 1 shows the graphic representation of IDEF0 diagram model.

Figure 1: IDEF0 Model

Source: the Authors, 2016

The box represents the system functions, activities, processes and subprocesses; while the arrows describe the relationship among the activities (CUNHA, 2015)

The boxes aim to show the key activities, where verbs and compound phrases are used. They are hierarquically decomposed in subactivity groups and joined in levels. The arrows represent entries, exits, controls (rules) and resources for the execution of

² Our translation to the terms proposed by ARAUJO (2008) “antes da porteira”, “dentro da porteira” e “fora da porteira”

each process/subprocess/Activity (CUNHA 2015). The IDEF0 diagram includes a table explaining what each arrow represents.

- The entry arrow: they are data and objects later transformed inside the activities.
- The control arrows: they direct how the process should work, such as safety rules or rules.
- The resources arrows: they indicate what is needed so that the activity works, such as people, tools, machines, equipment, etc.
- The exit arrows: they are all the information and results generated inside the boxes. They can be transmitted to other processes.

In this case it is noticed, in this case, that IDEF0 has some conditions and rules, such as: the entries should be placed on the left side of the diagram, the exits should be placed on the right side, the resources should be on the bottom of the diagram and the control should be placed on the top of the diagram (RABELO, s/d)

Modeling with IDEF0 can demonstrate accurately the functional decomposition, as well as flexibility for changes, clearness and concision aiming a correct comprehension for those who want to understand the process, it also provides time and resources saving, when there is a need for maintenance; and a clear identification of responsibilities in each process, as well (RABELO, s/d).

The Convenience Stores

Convenience stores are small establishments and offer shoppers a little variety of items.

They sell food and essential products. They are usually located in districts with a high flow of people. A feature of this kind of business is the application of units in smaller properties, with smaller stocks in relation to the supermarkets. The convenience stores offer products with a fast stock replenishment, serving people that need small purchases and look for options closer to their homes. There is a feature in this kind of store where customers can handle the product, check the expiration date and know the price before the purchasing decision (SEBRAE, s/d.).

Methods

To accomplish this work, it was used as a source of data collection, field research by observation inside the convenience store, and also technical scientific book research, as a means to make up the set of information needed, such as journals, books, internet articles among others.

During the visits it was observed the process related to the internal operation of the convenience store. The data was collected by observation. After that the ongoing processes were mapped with the use of IDEF0. This tool allowed us to analyze the operation that takes place inside the store.

After mapping all the company's processes, we collected data and information to help in the decision making to obtain the SI that fits better Farias Convenience Store.

Results

By observation we realized the need to study the company's processes, to map the store and this way get data and information to specify the ideal management system for Farias Convenience Store.

Four processes could be observed into Farias convenience Store. They are: Purchasing Process, Sales Process, Administrative and Financial Process and Operational Process.

Process Modeling

Figure 2 presents the IDEF0 diagram, in the highest abstraction level of the management process.

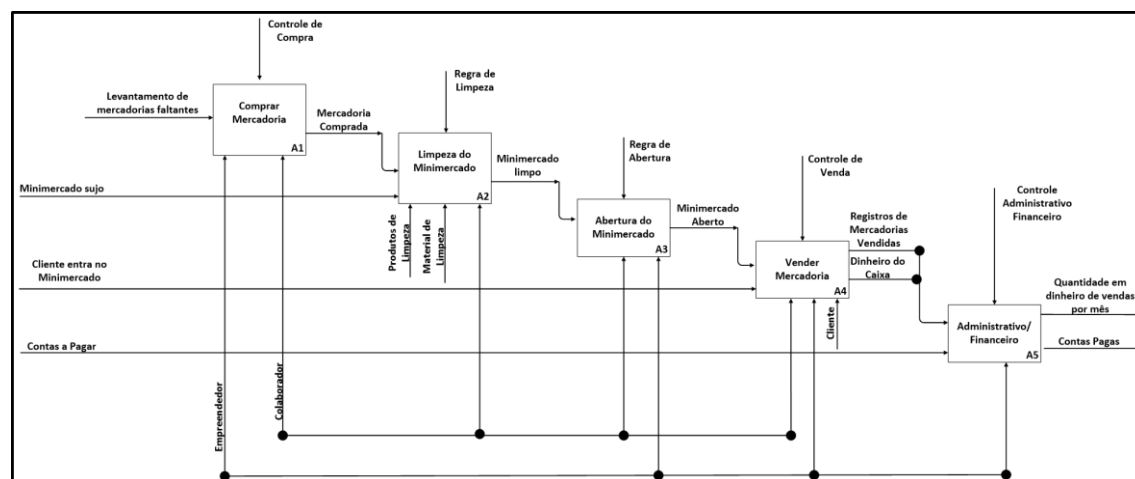
Figure 2: Convenience Store Management – IDEF0 level 0



Source: Authors

Figure 3 presents the first level of details of the Management Process, identifying the sub processes which make it up.

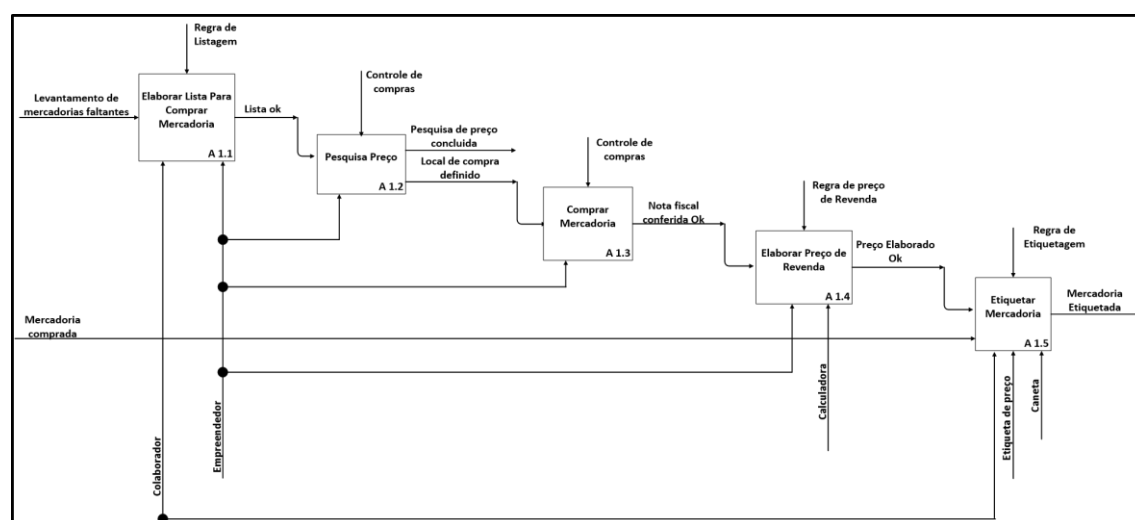
Figure 3: Convenience Store Management – Level 1



Source: Authors

Figure 4 presents the Purchasing Process in detail (Management Process sub process)

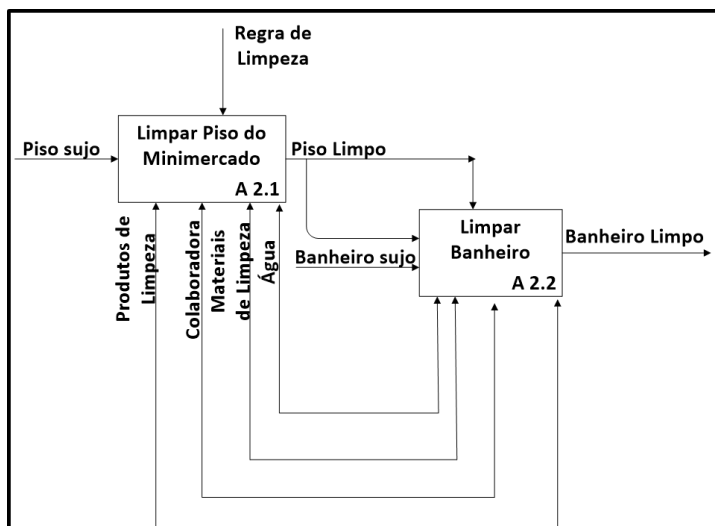
Figure 4: Convenience Store – Purchasing Process



Source: Authors

Figure 5 presents the sub process Convenience Store Cleaning in details

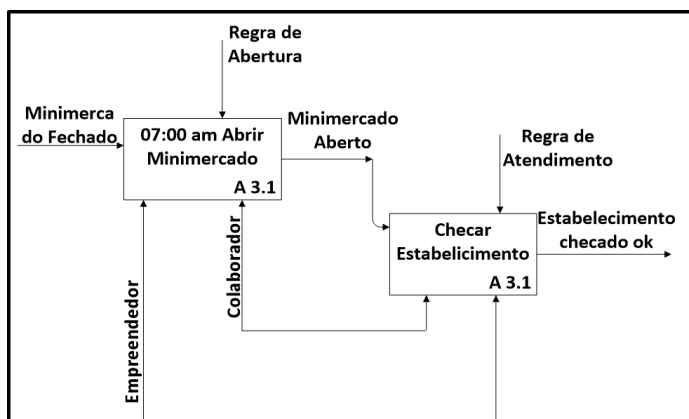
Figure 5: Convenience Store Management – Convenience Store Cleaning Process



Source: Authors

Figure 6 presents the Opening of a Convenience Store sub process in detail.

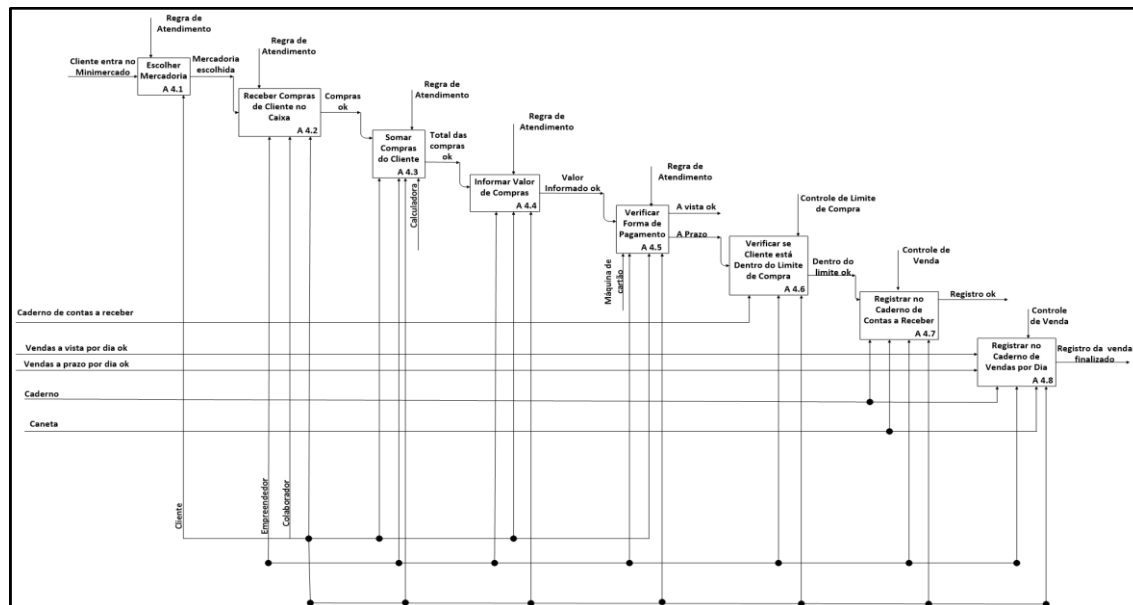
Figure 6: Convenience Store Management – The Opening of a Convenience Store Process



Source: Authors

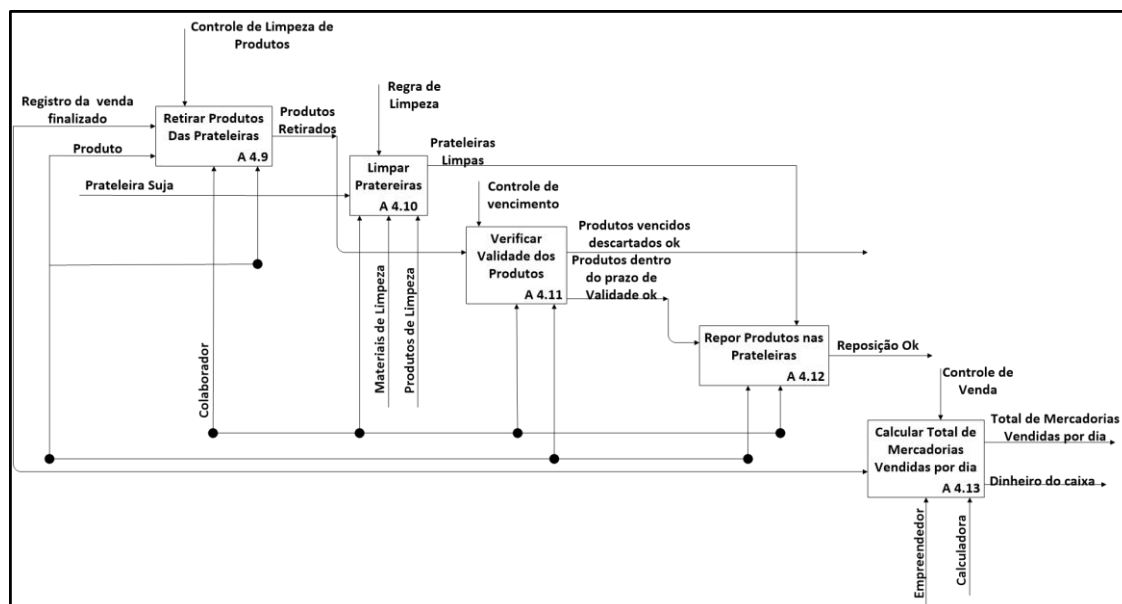
Figures 7 and 8 present the Sales sub process in details.

Figure 7: Convenience Store Management – Sales Process



Source: Authors

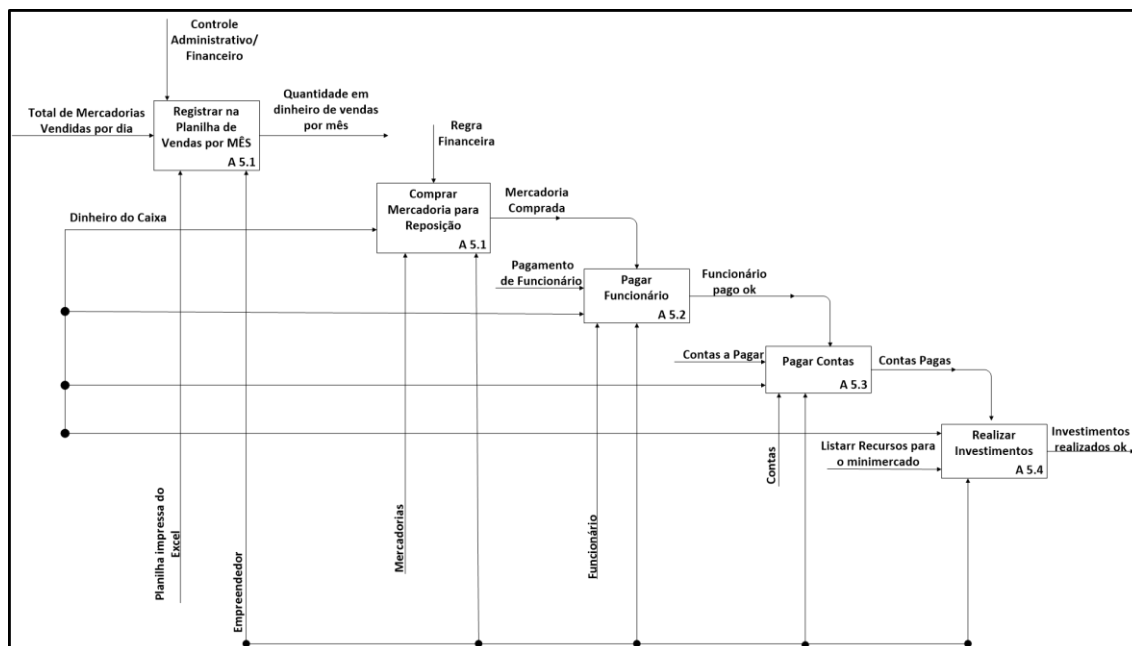
Figure 8: Convenience Store Management – Sales Process (continuity)



Source: Authors

Figure 9: Presents the Administrative and Financial sub process in details

Figure 9: Convenience Store Management – Administrative and Financial Process



Source: Authors

Figure 10 presents the table with the Management Process arrow meanings (Input, Rules, Resources, output, that appear in the 0 level Figure 2)

Figure 10: Arrows Explanation (0 Level) – Convenience Store Management Process

Input	Description
Shelf Monitoring	Monitoring shelves to check the products to be bought.
Purchased merchandise	Goods purchased for restocking.
Dirty Market	Cleaning before opening.
Customer comes into market	Customers come into Market for shopping.
Accounts Payable	Bills such as (water, electricity, rent, bank slips, among others) that have to be paid.
Accounts receivable	Booklet with customers that buy on credit and have to pay
Cash sales per day	All gods sold on cash is written down for sales control.
Term Sales per day	All goods sold on credit terms is written down for sales control
Products	Products on shelves for sale.
Sales Recording	After serving customers, the sales recording is done, finalizing the service.
Dirty Shelves	Cleaning the shelves twice a week. Deep cleaning taking off all goods.
Cash control	All sales cash, cash and deferred payments, received during the day.
Employees payroll	Employee salary
Buying resources for the store	Purchase (equipment, infrastructure, goods...). Convenience Store Investments.
Dirty Floor	The Market floor needs cleaning.

Convenience Store closed	The convenience store is open only at 7 am, when it is clean.
Output	
Pricing Research completed	Pricing survey is done to define the supplier
Labeling Merchandise	All goods purchased to be labelled with its price.
Sales income per month	The total sales income received in a month by the store.
Cash Payment ok	Goods sold in cash
Deferred Payment ok	Noting of goods sold on credit
Paid accounts	All paid bills, such as: water, electricity, rent, bank slips, among others.
Restocking ok	Products restocking on clean shelves.
Total goods sales per day	Sum of goods sold per day or cashier closing at the end of the store working hours
Investments ok	Equipment and merchandize to be bought for a higher profitability
Clean shelves	After removing all products from the shelves, they are cleaned and are ready for use.
Expired products discard ok	Expired products removed from shelves are entirely discarded
Clean restroom	The restroom has to be cleaned before the store opening hours.
Store checked ok	The store is clean and the employees and entrepreneur are ready to meet customers
Rules	
Listing rules	Before purchasing, it is necessary to have a list with products to be bought.
Purchasing control	There is the purchasing control of merchandises to be bought.
Resale price rule	It is necessary to calculate with the percentage on the invoice for the final price of the merchandise
Labelling rules	It is necessary to glue the price on each and every merchandise.
Serving rules	Making notes after serving customers and serving customers in a friendly way.
Purchase limit control	Before term sales, check if the client is within the limit granted by the entrepreneur
Sales control	Make notes of all sales in the notebook
Cleaning products control	Remove all products from shelves for cleaning
Cleaning rules	Opening the store only after it is clean
Cleaning shelves	Restock products on the shelves only if they are clean
Expiring date control	Control the expiring date of products on the shelves
Financial and administrative control	Administrative control by making notes of sales in a printed excel spreadsheet
Clean floor	Clean the floor before cleaning the restrooms
Opening rules	Open the store at 7 AM only if it is clean.
Financial Rules	Purchasing is done with cash on hand
Purchased merchandise	After goods are purchased the employees are paid
Employees paid	Bills paid if employees payroll is OK
Paid accounts	Invest when all accounts had been paid
Resources	
Calculator	Calculator used for accounts calculation
Entrepreneur	The store owner
Employees	Store workers
Pens	Pens for making notes of prices and goods sold
Customer	Store clients
Notebook	Notebook used for making sales notes

Card machine	Card machine for credit and debt
Cleaning materials	Products for cleaning such as: squeegee, broom, duster, cleaning flannel, floor cloth, etc.
Cleaning products	Products to clean the store, such as: washing powder, detergent, chlorine, etc.
Printed excel spreadsheets	Printed spreadsheets help with sales notes
Accounts	Accounts payable papers
Employees	Employees that work in the convenience store
Merchandise	Goods resold in the convenience store
Water	Water used for cleaning
Price label	Tags with merchandise prices

Generated data and information collection

Through mapping process, all the convenience store process data were collected and it was defined the information which should be generated by this process. Consequently, a set of requirements was obtained to guide the choice for which Information System would assist the convenience store management.

Data and information are summarized from charts 2 to 27.

Purchasing Process

Chart 1: Goods Purchasing List

Data	Information
List Goods Missing Collaborator Entrepreneur Convenience store	Goods replacement in the convenience store Which product should be purchased Quantity of each product to be purchased

Source: The Authors

Purchasing

Data	Information
Car Goods Money Supplier Entrepreneurs	Choose goods Goods Purchasing Take the purchasing goods to the convenience store

Source: The Authors

Chart 2: Pricing Research

Data	Information
Product Value Convenience store Retailers Entrepreneur	Product price per supplier. Defined supplier

Source: The Authors Chart 3: Goods

Chart 4: Resale Price

Data	Information
Purchased Goods Invoice Calculator Entrepreneur	Check purchased goods Define resale price

Source: The Authors

Chart 5: Goods label

Data	Information
Purchased goods Collaborators Label Pen Goods resale price	Write down goods price on the label Tag label on the goods

Source: The Authors

Cleaning Process

Chart 6: Floor Cleaning

Data	Information
Floor Dirt Broom Squeegee Disinfectant Detergent Collaborators	Environment cleaning

Source: The Authors

Chart 07: Restroom Cleaning

Data	Information
Restroom Dirt Broom Squeegee Disinfectant Detergent Collaborators	Restroom cleaning

Source: The Authors

Opening Process

Chart 08: Convenience Store Opening

out

Data	Information
07:00 a.m. Convenience store Opening Convenience store cleaning Collaborators Entrepreneur	Open the convenience store at 7 o'clock in the morning Open the convenience store when it is already cleaned

Source: The Authors

Chart 09: Convenience store checking

Data	Information
Place and equipment working properly Goods verified Contributor Entrepreneur	The place is ready to be opened.

Source: The Authors

Sales Process

Chart 10: Goods Choosing
cashier

Data	Information
Customer Goods Convenience store	Purchasing customers decision Customers catches the goods

Source: The Authors

Chart 11: Getting customers purchasing at the

Data	Information
Customer Goods chosen Contributor Cashier	Customer's purchasing Customer Answer the customer at the cashier

Source: The Authors

Chart 12: Adding Customer's purchasing

Data	Information
Customer Purchases Convenience store Collaborator Calculator	Purchasing sum up Purchase value

Source: The Authors

Chart 13: Inform Purchase value

Data	Information
Customer Purchase value Collaborator	Information about customer's debt.

Source: The Authors

Chart 14: Check Payment

Data	Information
Customer Purchase value Cash Credit card or debt Postponed payment	Customer's payment: cash or credit card

Source: The Authors

Chart 15: Check Purchase Limit

Data	Information
Customer's register Debt Date collaborator	Customer's debt Purchase date

Source: The Authors

Chart 16: Accounts Receivable

Data	Information
Customer's name Value Accounts receivable date	Amount of Money to receive from the customer Customer's payment date

Source: The Authors

Chart 17: Sales of the Day

Data	Information
Goods sold Goods value Date quantity	Goods sold identification Which goods was best bought. Goods with larger sale in a day. Larger sale date Smaller sale date Total value of goods sold per day

Source: The Authors

Chart 18: Get goods from the shelves

Data	Information
Goods Dust Shelves Collaborator	Get goods from the shelves Clean the products

Source: The Authors

Chart 19: Clean the shelves

Data	Information
Shelves Dirty Duster Cloth Detergent collaborator	Shelf cleaning with duster or cloth, using detergent

Source: The Authors

Chart 20: Get goods from the shelves

Data	Information
Goods Dust Shelves Collaborator	Get goods from the shelves Clean the products

Source: The Authors

Chart 21: Clean the shelves

Data	Information
Shelves Dirty Duster Cloth Detergent collaborator	Shelf cleaning with duster or cloth, using detergent

Source: The Authors

Chart 22: Register Month Sales replacement
Spreadsheet

Data	Information
Spreadsheets Numeric value of sales per month Convenience Store Entrepreneur	Convenience store revenue per month

Source: The Authors

Chart 23: Purchase of goods for

Data	Information
Replacement Goods Money from cash desk Entrepreneur	Use money from the cash desk to replace goods.

Source: The Authors

Source: The Authors

Source: The Authors

Chart 24: Pay the Employees (accounts)

Data	Information
salary Employee Date Money from Cash desk Entrepreneur	Pay employee's salary with money from cash desk

Source: The Authors

Chart 25: Payment of bills (paid

Data	Information
Money Bills Water tax Light tax Rent Date Entrepreneur	Pay water tax in cash Pay light tax in cash Pay the rent in cash Pay the bills in cash on the date

Source: The Authors

Chart 26: Make investments

Data	Information
Money left over	The left-over
Purchase	money should be
Equipment/devices	invested in
Purchase new	purchasing new
products	equipment and
	products

Source: The Authors

Final Considerations

According to the following results, it is possible to conclude that managers should be aware of the processes that take place inside their companies so that they have a better management and control of the process, in order to mitigate losses and be prepared to face competitors' threats; besides being surrounded by safe and reliable information..

From these outcomes, it was observed that the IDEF0 provided better information about Farias Convenience store processes, making the information and data collection easier, helping the entrepreneur to manage the market and choose a proper IS to feed the business needs.

Knowing the process steps, the manager may be ahead of possible problems to avoid unnecessary labor, waste of raw material and, above all, cost increase, becoming a social, economic, and environmental responsible company.

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